

**EVALUATION OF DUCWEED'S INFLUENCE ON WATER
QUALITY OF BRULLUS LAKE, EGYPT, USING REMOTE
SENSING TECHNIQUES AND GEOGRAPHIC
INFORMATION SYSTEMS**

Submitted By

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B.Sc. of Science, (Chemistry), Faculty of Science, Helwan University, 2000
Master of Environmental Science, Institute of Environmental Studies and Research,
Ain Shams University, 2009

A thesis submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Sciences

Department of Environmental Basic Sciences
Institute of Environmental Studies and Research
Ain Shams University

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Giving

To the sprite of my mother

To my Father

For anyone benefits of this thesis

Please Pray for my Mother

God Bless My Mother

Acknowledgment

In the name of Allah the merciful the beneficent

In the beginning, I am very indebted to My Dead Mother for her continuous supporting to me in the past, present and future, god bless you my mother

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ABSTRACT

Lakes are important sources of fresh water and fish production all over the world. Egyptian lakes have severe problems and some of them have special nature. These lakes have an ecosystem of distinctive nature and are facing many challenges. Lake Burullus is one of the vulnerable Egyptian coastal lakes. The lake receives waste water from 7 drains (7, 8, 9, 11, Burullus east and west and El Gharbia). It is subjected to tremendous pressures causing rapid environmental degradation and dramatic threats to its ecosystems.

Water quality monitoring in water bodies incorporating the use of earth observation products has become a major component in many a water quality monitoring program. This is majorly due to the inadequacies of traditional methods imposed by the lack of comprehensive and reliable in-situ datasets.

Aquatic plants have been considered a promising approach to remove different elements from water not only for its low cost comparing to the conventional wastewater treatment but also for its environmental issues.

The present study aimed to evaluate the water quality of Burullus Lake and drains, assess the RS and GIS techniques applicability to map water quality of the selected parameters of Burullus Lake, investigate the potential of duckweed for treating drain 9 wastewater as a way of enhancing water quality of Burullus Lake and to apply Qual2k model to investigate the potential of constructed wetlands covered by duckweeds and connected to the branches of drain No. 9, on the concentrations of the selected water quality parameters at the outflow of the drain No. 9.

Spatial distribution of pH, HCO_3 , CO_3 , *Chl-a*, turbidity, NH_4 , N-NH_4 , N-NO_3 , TDS, Phosphate, Heavy metals (Pb, Cu, Zn), Cations (Na, Mg, K, Ca) and Anions (Cl , SO_4) were the parameters of interest.

Digital maps showed that the southern section of the lake more polluted than the other sections and that due to the drainage wastewater which received.

The results of biological treatment appeared that *L. gibba* plants have high efficiency in removing nutrients; TP, TN, NH_4 and NO_3 by 65, 73.55, 75.51 and 90.0 respectively. The plant also showed high potential for *Chl_a* removal by 87.25%. In addition, the plant have effectively removed the heavy metals Pb and Cu by 100% but removed Zn by 95%.

The results showed also that QUAL2K proved to be an effective tool in the comparative evaluation of potential water quality improvement programs, particularly on water quality parameters of drain 9 and its

tributaries. For all considered scenarios, most selected water quality parameters of drain9 were improved significantly and complied with the standards of Egyptian law 48/1982 .So the study recommended that construct wetland at the start of the drain to enhance the ecology of lake. The study also recommended that remote sensing coupled with GIS could afford an integrated scheme for mapping water quality.

Keywords: Burullus Lake – Water quality – Remote sensing - Biological treatment
– QUAL2K

TABLE of CONTENTS

Subject	Page
List of contents	vi
List of tables	x
List of figures	xi
CHAPTER (1): INTRODUCTION	
1.1 North lakes	1
1.2 Lake Burullus	2
1.3 Research objectives	4
CHAPTER (2): LITERATURE REVIEW	
2.1. North lakes importance and problems	6
2.2. Lake Burullus importance and problems	7
2.3. Lake Burullus Climate	11
2.4. Lake Burullus Vegetations	11
2.5.Tradition methods for monitoring water quality	13
2.6. Application of Remote Sensing Techniques in water quality Studies	17
2.6.1.Development of water quality parameters by Remote sensing	23
2.7. Wastewater Treatment	24
2.8. Aquaculture Treatment	25
2.9. Potential of Duckweed for wastewater Treatment	28
2.10. Qual2k model	34
CHAPTER (3): MATERIALS AND METHODS	
3.1. Study area	38
3.2. Field studies and sampling	39
3.2.1. Aquatic plants	39
3.2.2. Data and water samples Collection	39
3.2.2.1. Laboratory measurements of water quality parameters	40
3.3. Statistical analysis	42
3.4. Remote sensing	42
3.4.1. Softwares	44
3.4.2. Image Processing	44
3.4.2.1. Geometric Correction	44
3.4.2.2. Radiometric Normalization Correction	45
3.4.2.2. 1. Conversion of raw DN's to spectral radiance at the sensor	46

3.4.2.2.2. Conversion of radiance to TOA reflectance	46
3.4.2.3. Atmospheric Correction	46
3.4.2.3.1. Radiance Conversion	47
3.4.2.3.2. Conversion to Top-of-Atmosphere Reflectance	48
3.4.2.3.3. Atmospheric and Topographic Correction	48
3.4.3. Spatial Subsetting	49
3.5. Monitoring Water Quality by Remote Sensing	49
3.6. Statistical analysis	50
3.7. Geographic Information Systems (GIS)	50
3.8. Water treatment of drain 9 by Duckweed	50
3.8.1. Duckweed plants	50
3.9. Biological treatment of the drain wastewater	51
3.9.1. Drainage water sampling and Experiment setup	53
3.10. Integration of duckweed experiments with the Qual2k model	54
3.10.1. Modeling Procedure	54
3.10.2. Water Sampling:	55
CHAPTER (4): RESULTS AND DISCUSSION	
4.1. Aquatic plants in Burullus Lake	56
4.2. Water characteristics of Burullus Lake	60
4.2.1. Physical variables of Burullus Lake water:	63
4.2.1.1. Water Temperature:	63
4.2.1.2. Hydrogen ion concentration (pH)	63
4.2.1.3. Turbidity	65
4.2.1.4. Total Dissolved Salts (TDS)	66
4.2.2. Chemical variables of Burullus Lake water	66
4.2.2.1. Major cations (Na^+ , K^+ , Ca^{2+} and Mg^{2+})	66
4.2.2.2. Major anions (CO_3^{--} , Cl^- , HCO_3^{--} and SO_4^{2-})	68
4.2.2.3. Phosphate	70
4.2.2.4. Nitrogen compound	71
4.2.2.4.1. Ammonia-Nitrogen	71
4.2.2.4.2. Ammonia (NH_4)	72
4.2.2.4.3. Nitrates- Nitrogen (NO_3^{--} -N)	72
4.2.2.5. Heavy Metals	73
4.2.2.5.1. Copper (Cu)	74
4.2.2.5.2. Lead (Pb):	74
4.2.2.5.3. Zinc (Zn)	76
4.2.3. Biological Variables of Burullus Lake Water:	77
4.2.3.1. Chlorophyll <i>a</i> :	77
4.2.4. Correlation analysis:	78

4.3. Remote Sensing Results	80
4.3.1. Correlating water quality and reflectance	80
4. 4. 3.2. Development of water quality parameters models	87
4.3.2.1. Estimating Temperature	87
4.3.2.2. Chlorophyll-a	87
4.3.2.2.1. Chlorophyll a regression model	78
4.3.2.3 .Turbidity	90
4.3. 2.3.1.Turbidity Map	91
4.3.2.4. NH ₄ -N	93
4.3.2.5. Phosphate	95
4.4. Cartographic Maps from GIS Analysis	96
4.5. Physico-chmeical properties of Drains discharged in Burullus Lake	106
4.6. Evaluation of <i>Lemna gibba</i> in Drain 9 Treatment	109
4.7. Qual2k Results	110
4.7.1. Calibration	110
4.6.2. Model validation	115
5.1.Conclusions and Recommendations	128
CHAPTER (5) CONCLUTIONS AND RECOMMENDATIONS	
Summary	130
ENGLISH SUMMARY	
REFERENCES	
ARABIC SUMMARY	

LISTOF TABLES	
Subject	Page
Table (3.1): Available remote sensing data	43
Table (3.2): Landsat ETM+ Spectral Bands	44
Table (4.1): Aquatic plants of Burullus Lake in fifteen locations and their frequencies	59
Table (4.2): Physicochemical properties of fifteen locations at Burullus lake	62
Table (4.3): Correlation analysis between the physico-chemical properties in the fifteen sites located at Burullus Lake	79
Table (4.4): Digital values (DN) for the ETM+ image	81
Table (4.5): Radiance for the ETM+ image	81
Table (4.6): Reflectance for the ETM+ image	82
Table (4.7): Reflectance and Band ratio for satellite image	83
Table (4.8): Correlation matrix between water quality parameters and reflectance data For Burullus Lake.	85
Table (4.9): Regression model developed for Chl_a estimation	88
Table (4.10) Regression model developed for Turbidity estimation	92
Table (4.11) : Physicochemical properties of Drains water discharged in Burullus lakes	108
Table (4.12): Performance of duckweeds in treatment of drain 9	110
Table (4.13): Mean Multiplicative Error (MME) of QUAL2K simulations for the Drain9	111
Table Table (4.14): Comparing the output model with Law48/1982	122

LIST OF FIGURES

Subject	Page
Figure (3.1): Locations of the northern Egyptian Lakes	31
Figure (3.1): Locations of the northern Egyptian Lake	38
Figure (3.2): Map of Lake Burullus drains and sampling stations.	39
Figure (3.3): field trip sampling and data collection	40
Figure (3.4): Illustrates the Structure of a Digital Image and Multispectral Image	43
Figure (3.5): Three approaches to atmospheric correction	47
Figure (3.6): Duckweeds (<i>Lemna gibba</i> L., family, <i>Lemnaceae</i>)	51
Figure (3.7): Duckweed experiment for drain 9 treatment	52
Figure (3.8) layout of drain9	54
Figure (3.9) segmentation of drain 9	54
Figure (4.1) Aquatic plants recorded in Lake Burullus in fifteen stations	60
Figure (4.2) : pH of fifteen locations within Burullus lake	64
Figure (4.3): Water turbidity of fifteen locations within Burullus Lake.	56
Figure (4.4): Water TDS of fifteen locations within Burullus Lake.	66
Figure (4.5): Major cations (Na ⁺ , K ⁺ , Ca ²⁺ and Mg ²⁺) in water of fifteen locations within Burullus Lake.	68
Figure (4.6): Major anions (Cl ⁻ , HCO ₃ ⁻ and SO ₄ ²⁻) in water of fifteen locations within Burullus Lake.	69
Figure (4.7): PO ₄ ⁻ in water of fifteen locations within Burullus lake.	70
Figure (4.8): Nitrogen compound in water of fifteen locations within Burullus Lake.	74
Figure (4.9) : Copper (Cu) concentration in water of fifteen locations within Burullus lake.	75
Figure (4.10) : Lead (Pb) concentration in water of fifteen locations within Burullus Lake.	75
Figure (4.11): Zinc (Zn) concentration in water of fifteen locations within Burullus Lake.	76

Figure (4.12): Chl_a content in water of fifteen locations within Burullus Lake.	77
Figure (4.13): Lake surface temperature from NOAA during January 2014	87
Figure (4.14) : Comparison of measured vs predicted Chla concentrations	89
Figure (4.15): Distribution of Chla concentration	91
Figure (4.16): Distribution of Turbidity concentration	92
Figure (4.17): Comparison of measured vs predicted Turbidity concentration	93
Figure (4.18): Distribution of NH ₄ -N concentration	94
Figure (4.19) Comparison of Actual NH ₄ -N vs Predicted N-NH ₄ concentrations	94
Figure (4.20): Distribution of phosphorous concentration	95
Figure (4.21): Comparison of measured vs Predicted phosphate concentrations	96
Figure (4.22): Cartographic map of pH as obtained from the GIS analysis	97
Figure (4.23): Cartographic map of TDS as obtained from the GIS analysis	98
Figure (4.24): Cartographic map of NO ₃ -N as obtained from GIS analysis	99
Figure (4.25): Cartographic map of NH ₄ as obtained from the GIS analysis	99
Figure (4.26): Cartographic map of Ca as obtained from the GIS analysis	100
Figure (4.27): Cartographic map of Mg as obtained from the GIS analysis	100
Figure (4.28): Cartographic map of Na as obtained from the GIS analysis.	101
Figure (4.29): Cartographic map of K as obtained from the GIS analysis.	101
Figure (4.30): Cartographic map of Cl as obtained from the GIS analysis	102
Figure (4.31): Cartographic map of SO ₄ as obtained from the GIS analysis	102
Figure (4.32): Cartographic map of HCO ₃ ⁻⁻ as obtained from the GIS analysis	103
Figure (4.33): Cartographic map of Pb as obtained from the GIS analysis	104
Figure (4.34): Cartographic map of Zn as obtained from the GIS analysis	104
Figure (4.35): Cartographic map of Cu as obtained from the GIS analysis	105
Figure (4.36): Dendrogram results from the agglomerative clustering	109

technique based on the physico-chemical properties of drains 7, 8, 9 and 11 wastewater discharged in Burullus Lake.	
Figure (4.37) DO concentration (mg/l) January – June 2014 (Calibration)	111
Figure (4.38) BOD concentration (mg/l) January – June 2014 (Calibration)	112
Figure (4.39) CBOD concentration (mg/l) January – June 2014 (Calibration)	112
Figure (4.40) EC concentration (μ mhos) January – June 2014 (Calibration)	113
Figure (4.41) NH ₄ concentration (μ gN/L) January – June 2014 (Calibration)	113
Figure (4.42) NO ₃ concentration (μ gN/L) January – June 2014 (Calibration)	114
Figure (4.43) pH concentration values January – June 2014 (Calibration)	114
Figure (4.44) TP concentration (μ gP/L) January – June 2014 (Calibration)	115
Figure (4.45) TSS concentration (mg D/L) January – June 2014 (Calibration)	115
Figure (4.46) DO concentration (mg/l) August 2014 (Validation)	116
Figure (4.47) BOD concentration (mg/l) August 2014 (Validation)	116
Figure (4.48) COD concentration (mg/l) August 2014 (Validation)	117
Figure (4.49) NH ₄ concentration (mg/l) August 2014 (Validation)	117
Figure (4.50) NO ₃ concentration (mg/l) August 2014 (Validation)	118
Figure (4.51) pH concentration (mg/l) August 2014 (Validation)	118
Figure (4.52) TP concentration (mg/l) August 2014 (Validation)	119
Figure (4.53) TSS concentration (mg/l) August 2014 (Validation)	119
Figure (4.54) EC concentration (mg/l) August 2014 (Validation)	120
Figure (4.55). Model predictions of pH along drain 9 at the 5 scenarios	126
Figure (4.56). Model predictions of TP along drain 9 at the 5 scenarios	126
Figure (4.57). Model predictions of TSS along drain9 at the 5 scenarios	128
Figure (4.58). Model predictions of DO along drain 9 at the 5 scenarios	128
Figure (4.59) Model predictions of COD along drain 9 at the 5 scenarios	125
Figure (4.60) Model predictions of BOD along drain 9 at the 5 scenarios	125
Figure (4.61) Model predictions of Nitrate along drain 9 at the 5 scenarios	126
Figure (4.62) Model predictions of Ammonia along drain 9 at the 5 scenarios	126
Figure (4.63) Model predictions of conductivity along drain 9 at the 5 scenarios	127